CLAIMS

1. A method for manufacturing patterns on a reticle blank comprising a substrate made from material transparent to UV irradiation and having a first surface and a second opposite surface, the first surface coated with a chrome layer, the method comprising:

providing at least one of a plurality of ultra-short pulsed laser beams;

providing focusing means for focusing said at least one of a plurality of ultra-short pulsed laser beams at at least one of a plurality of target locations;

providing relative displacement facilitator for facilitating relative displacement of the reticle blank relative to said at least one of a plurality of target locations;

providing a controller for controlling the synchronization and operation of the laser beam source, the focusing means and the relative displacement facilitator;

irradiating the ultra-short pulsed laser beam in a predetermined pattern directed at the second surface and passing through the substrate, wherein said at least one of a plurality of target locations is focused on the chrome layer or on its proximity.

2. The method of Claim 1, wherein said at least one of the plurality of target locations is focused in a zone within the substrate extending up to 50 microns from the chrome layer.

3. The method of Claim 1, wherein the ultra-short pulsed laser beams' wavelength is in the range of 350 to 1500 nanometer.

4. The method of Claim 1, wherein the ultra-short pulsed laser beams are pulsed in the range of 10 to 500 femtoseconds.

5. The method of Claim 1, wherein the chrome layer of the substrate is coated with anti-reflective layer.

6. The method of Claim 1, wherein the plurality of ultra-short pulsed laser beams is obtained by splitting a primary ultra-short pulsed laser beam using beam splitter.

7. The method of Claim 1, wherein the plurality of ultra-short pulsed laser beams is passed through a light modulator array, comprising an array of individually controllable elements that are each adapted to be set to either allow each beam of the plurality of ultra-short pulsed laser beams to traverse through, or effectively block it, thus achieving control over each beam separately.

8. The method of Claim 7, wherein the focusing means comprises a microlens array, consisting of an array of microlens elements foci of predetermined lengths, said microlens array elements corresponding to the elements of the light modulator array so that a beam passing through an element of the light modulator array is focused by a corresponding element of the microlens array onto a target location.

9. The method of Claim 1, wherein the relative displacement facilitator comprises a motor-driven XYZ moving stage.

10. The method of Claim 9, wherein said motor-driven moving stage is computer-controlled.

11. The method of Claim 1, wherein the relative displacement facilitator comprises a laser beam angle scanner.

12. The method of Claim 1, wherein the relative displacement facilitator comprises a motor driven XYZ stage and a laser beam angle scanner

13. The method of Claim 1, wherein in order to attenuate higher order diffraction effects the target locations in the reticle blank, , said at least one of a plurality of target locations is focused in a phase shifting layer confined to a zone in the proximity of the chrome layer so as to change locally the index of refraction of that zone, the phase shifting zone extending in front and along edges of a predetermined pattern.

14. The method of Claim 13, wherein the predetermined pattern is present on the chrome layer.

15. The method of Claim 13, wherein the predetermined pattern is not present on the chrome layer.

16. The method of Claim 13, wherein the phase shifting layer is distanced from the chrome layer by up to 10 microns.

17. The method of Claim 13, wherein the phase shifting layer has a thickness that is $\lambda/2(n-n')$, where λ is the wavelength of an anticipated lithography process light source beam, n' is the index of refraction for the transparent material of the phse shifting layer of the substrate and n is the index of refraction of the substrate outside the phase shifting layer.

18. The method of Claim 17, wherein the thickness of the phase shifting layer is in the range of 0.12 to 3.0 microns.

19. An apparatus for manufacturing patterns on a reticle blank made from material transparent to UV irradiation and having a first surface and a second opposite surface, the first surface coated with a chrome layer, the apparatus comprising:

a plane polarized ultra-short pulsed laser beam source adapted to generate a primary plane polarized light beam;

a beam splitter, adapted to split the primary light beam into a plurality of secondary light beams;

a light modulator array, comprising an array of individually controllable elements that are each adapted to be set to either allow each beam of the plurality of secondary light beams to traverse through, or effectively block it;

a microlens array, comprising an array of microlens elements having foci of predetermined lengths, said microlens array elements corresponding to the elements of the light modulator array so

that light beam passing through an element of the light modulator array is focused by a corresponding element of the microlens array;

control means adapted to independently switch each of the elements of the light modulator between a transparent and opaque modes in a predetermined manner; and

relative displacement facilitator for facilitating relative displacement of the reticle blank relative to said foci.

20. The apparatus of Claim 19, wherein the relative displacement facilitator comprises a motor-driven XYZ moving stage.

21. The apparatus of Claim 20, wherein said motor-driven moving stage is computer-controlled.

22. The apparatus of Claim 20, wherein the relative displacement facilitator comprises a laser beam angle scanner.

23. The apparartus of Claim 20, wherein the relative displacement facilitator comprises a motor driven XYZ stage and a laser beam angle scanner.